

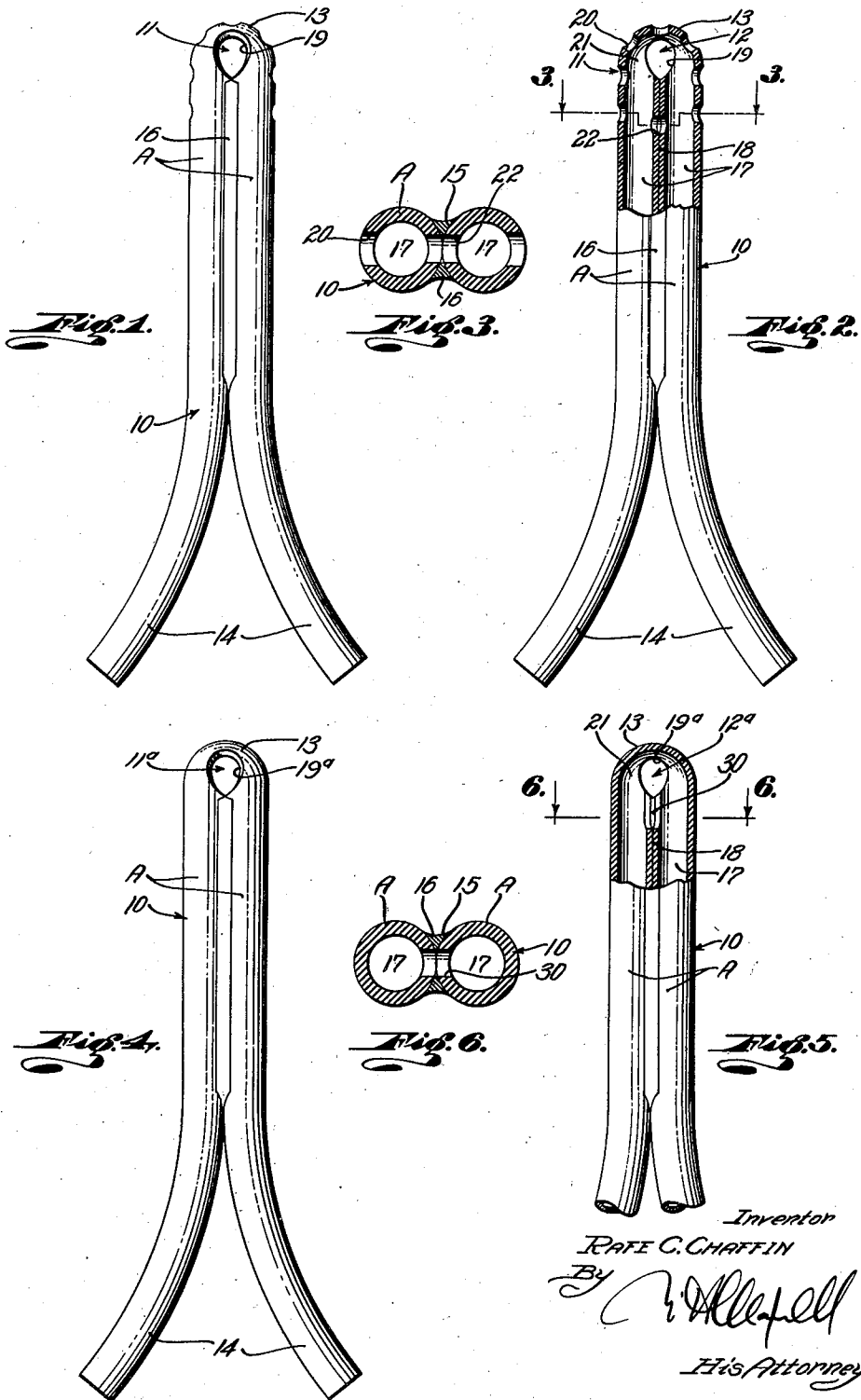
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SURGICAL SUCTION DRAINAGE AND IRRIGATION TUBE

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SURGICAL SUCTION DRAINAGE AND
IRRIGATION TUBE

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This invention relates to means for draining and irrigating surgical cavities, etc. and relates more particularly to an improved surgical drainage and irrigation tube. A general object of this invention is to provide a safe and particularly effective suction drainage tube and irrigation tube.

Another object of this invention is to provide a surgical drainage tube that operates to effectively remove blood, pus, mucous, and other liquid secretions from surgical cavities and operation wounds, without creating a negative pressure in the cavity or wound and therefore without drawing tissue into the tube. The device of the invention may be termed a suction drainage tube when designed or used for drainage purposes but does not in any case create an undesirable negative pressure in the body cavity or wound.

Another object of this invention is to provide a surgical drainage tube in which the air or other fluid supplied from an external source is directed through the tube in such a manner that it operates by a mild or permissive induction action to carry away the blood, pus, or secretions and cannot create an undesirable or harmful negative pressure in the wound or cavity.

Another object of this invention is to provide a surgical tube of the character referred to that is equally successful and operative as a drainage tube and an irrigation tube operating in both cases in a mild, yet effective, manner without drawing on the tissues or washing against the tissues with any appreciable force.

Another object of this invention is to provide a surgical tube of the character referred to that will not clog or close against the flow of the drainage or irrigation fluid and that is fully operative in very confined places.

The various objects and features of my invention will be fully understood from the following detailed description of typical preferred forms and applications of the invention, throughout which description reference is made to the accompanying drawing, in which:

Fig. 1 is a side elevation of one form of the invention. Fig. 2 is a view similar to Fig. 1 with the inner or active portion of the device appearing in longitudinal cross section. Fig. 3 is an enlarged transverse detailed sectional view taken as indicated by line 3—3 on Fig. 2. Fig. 4 is a view similar to Fig. 1, illustrating an alternative form of the invention. Fig. 5 is a fragmentary side elevation of the tube illustrated in Fig. 4 with the outer or active portion of the tube in longitudinal cross section, and Fig. 6 is an

enlarged transverse detailed sectional view taken as indicated by line 6—6 on Fig. 5.

Referring now to Figs. 1, 2 and 3 the invention may be said to comprise, generally, a tube body 10 shaped to have two fluid conducting arms A in side by side relation, fluid inlet and discharge means 11 at the juncture of the arms A, and by-pass means 12 connecting the arms.

The instrument or device of the present invention may be formed from a length of flexible resilient tubing such as rubber tubing, or if desired, may be molded or otherwise formed of flexible resilient material. When the body 10 of the device is formed of a length of rubber tubing the tubing is folded or bent back upon itself at a point between its ends to have the two tube arms A. The shaping or bending of the tube in this manner provides the device with an end 13 that is rounded or convex and that has somewhat flattened sides. The two tube arms A extend in side by side relation for a substantial distance and may have free or convergent outer portions 14 adapted for convenient connection with the fluid supply means and fluid discharge means. The tube arms A may be cemented, vulcanized or otherwise secured together where they are in parallel relation. For example, the grooves 15 occurring where the arms A are parallel may be occupied by cement or vulcanized rubber 16 as best illustrated in Fig. 3. The cement or rubber 16 connects the arms A and serves to maintain the arms in side by side relation to constitute a single elongate tube structure. The arms A are continuously tubular, having central longitudinal passages 17 which may be round or cylindrical and uniform in diameter. The passages 17 are of the same diameter in the construction illustrated, it being apparent that they may be unequal in size if desired. It will be observed that the passages 17 of the arms A are separated by the joined together walls of the tubes A that form a central partition 18. It will be seen that the body 10 of the surgical tube may be inexpensively made from a single length of suitable rubber tubing.

The fluid inlet and discharge means is provided at the active end of the body 10, that is, at the part 13. The means 11 includes two laterally facing openings 19 in the opposite sides of the end part 13. The openings 19 are diametrically opposite and of like size and configuration. While the openings 19 may be formed in any selected manner I have found it desirable to provide a transverse opening or notch in the wall of the tube at the point where the tube is to be

bent and by bending the tube to bring the arms A in side by side relation the opposite side portions of the notch constitute the openings 19. If necessary the tube material may be trimmed away at the openings 19 to leave smooth edges.

In the form of the invention illustrated in Figs. 1, 2 and 3 of the drawing the fluid inlet and discharge means further includes a plurality of ports or openings 20 in the wall of the end part 13. The openings 20 are spaced longitudinally of the device, being arranged in a series that extends across the end part 13 and continues for some distance along the outer sides of the arms A. The number, spacing and size of the openings 20 may be varied as conditions may require. The endmost openings 20 of the series or row may be in planes below or rearward of the openings 19 and the end of the partition 18.

The by-pass means 12 is a feature of the invention operating to assure the effective operation of the tube and yet prevent the development of excessive negative pressures at the end of the tube when it is used as a drainage tube and to prevent a harsh positive flow and excessive pressure when the device is used as an irrigation tube. The by-pass means 12 serves to connect the passages 17 of the tube arms A so that the fluid may flow or by-pass from one passage 17 to the other, lessening the inductive action and the resultant negative pressure when the device is used as a drainage tube and preventing the development of excessive pressures at the exterior of the device when the device is used as an irrigation tube.

The by-pass means 12 comprises the space or chamber 21 that occurs in the end part 13 at the juncture of the passages 17. The chamber 21 forms an unbroken and unrestricted space or fluid duct connecting the two passages 17. The fluid handled, whether used for drainage or irrigation purposes, is free to flow through the chamber 21 from one passage 17 to the other, within the confines of the device, so that unwanted negative pressures and superatmospheric pressures cannot be developed in the surgical cavity. The fluid when utilized for drainage purposes passes through the chamber 21 from one arm A to the other to flow past the openings 19 and 20 and to flow through the openings. The drainage fluid passing through the chamber 21 draws or induces the blood, secretions, etc. from the surgical cavity by a mild inductive action and in some cases may pass through the openings 19 and 20 into the surgical cavity to return through the openings to the chamber 21. In any case the continuous, unrestricted chamber 21 connecting the passages 17 prevents a development of excessive negative pressure in the operation wound or surgical cavity and yet provides an efficient drainage action. Where water or other fluid is passed through the tube for irrigation purposes it is free to continue through the chamber 21 to pass from one arm passage 17 to the other and, of course, is free to discharge through the openings 19 and 20 and to re-enter the openings. The irrigation fluid cannot build up an excessive pressure in the surgical cavity as the chamber 21 remains open at all times to allow a continuous free discharge.

The by-pass means 12 may further include one or more lateral openings 22 in the partition 18. In the particular case illustrated there is a single opening 22 spaced from the inner extremity of the partition 18. The opening 22 serves to directly connect the passages 17 permitting a flow

of fluid from one passage to the other and assisting the chamber 21 in the by-passing of the fluid. If for any reason the flow through the chamber 21 becomes lessened or restricted the fluid, whether irrigation fluid or drainage fluid, is free to pass through the opening 22 so that an undesirable pressure condition cannot build up at the end of the device. It is important to locate the opening 22 so that it cannot become closed under any condition of use.

Figs. 4, 5 and 6 of the drawing illustrate an alternative or modified form of the invention comprising a tube body 10 having arms A in side by side relation, a fluid discharge and inlet means 11^a and a connecting means or by-pass means 12^a joining the tube arms A.

The body 10 and its arms A may be the same as in the other form of the invention. The fluid discharge and inlet means 11^a comprises openings 19^a at the opposite sides of the end part 13. The openings 19^a may be identical with the openings 19 above described. In this construction the ports or openings 20 in the part 13 may be eliminated.

The means 12^a for connecting the passages 17 for the free flow of the drainage or irrigation fluid comprises the chamber 21 in the part 13 as in the previously described form of the invention. In the construction illustrated in Figs. 4, 5 and 6, the means 12^a further includes a notch or slot 30 in the partition 18 for by-passing or conducting the fluid from one passage 17 to the other. The slot 30 extends longitudinally from the extremity of the partition 18 and is of selected width and length. It will be seen that the slot 30 assists the chamber 21 in by-passing or conducting the irrigation fluid or drainage fluid from one passage 17 to the other.

The structure illustrated in Figs. 4, 5 and 6 operates in the same manner as the previously described form of the invention. When the device is used as a drainage tube, air or other fluid is passed through one tube arm A to discharge through the other arm. The fluid is delivered to the chamber 21 and passes through the chamber to discharge from the discharge arm A. The fluid flowing through the chamber 21 past the openings 19^a induces the fluids from the surgical cavity or operation wound into the tube and carries the fluids away through the discharge arm A. In this connection it is to be observed that the drainage fluid draws the blood, secretions, etc. into the tube by a very mild induction action and does not create a negative pressure in the surgical cavity. There is always a free passage through the chamber 21 and the slot 30 and a negative pressure cannot build up in the surgical cavity. Where water or other fluid is passed through the tube for irrigation purposes it is free to flow through the chamber 21 from one passage 17 to the other and, of course, may discharge through the openings 19^a. The irrigation fluid cannot create or build up excessive pressure and cannot have a harsh washing action because it has a free unrestricted flow through the chamber 21 and slot 30 which are confined within the tube structure. The surgical tube of the invention constructed as shown in Figs. 1 to 3, inclusive, or as in Figs. 4 to 6, inclusive, is inexpensive and durable and is efficient in operation.

Having described only typical preferred forms and applications of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear

to those skilled in the art or fall within the scope of the following claims:

Having described my invention, I claim:

1. A surgical suction drainage tube comprising an elongate flexible body divided into two longitudinal passages one for connection with a source of negative pressure, the other for admission of fluid, the tube having an outer end portion continuing from the body forming a chamber which joins the passages of the body for flow of fluid therebetween, and a partition in said chamber directing the flow between the passages to the forward end of the chamber, there being a plurality of openings in said outer end portion to admit matter into the chamber to be carried by the flow of fluid therethrough, there being a bypass opening in the partition for bypassing fluid from one passage to the other in the event the end portion becomes distorted or material in the chambers tends to stop flow between the passages.

2. A surgical suction drainage tube comprising an elongate flexible body divided into two longitudinal passages one for connection with a source of negative pressure, the other for admission of fluid, the tube having an outer end portion continuing from the body forming a chamber which joins the passages of the body for flow of fluid therebetween, and a partition in said chamber directing the flow between the passages to the forward end of the chamber, there being a bypass opening in the partition for bypassing fluid from one passage to the other, and a plurality

of inlet openings in the outer end portion located outwardly beyond the said bypass.

3. A surgical tube comprising an elongate flexible tubular body having its wall cut away at one side at a point intermediate its ends forming a notch in the body communicating with the interior of the body, the body being bent at said notch so the portions of the body adjacent the notch are in side by side relation and so the said notch is in the crotch of the bend forming an open passage between the joined ends of said portions of the body and also forming spaced inlet openings into said passage, the said portions of the body being joined in said side by side relation.

4. A surgical tube comprising an elongate flexible tubular body having its wall cut away at one side at a point intermediate its ends forming a notch in the body communicating with the interior of the body, the body being bent at said notch so the portions of the body adjacent the notch are in side by side relation and so the said notch is in the crotch of the bend forming an open passage between the joined ends of said portions of the body and also forming spaced inlet openings into said passage laterally of the body, the said portions of the body being joined in said side by side relation, there being a bypass opening through the adjoining walls of said body portions joining the said portions of the body to bypass fluid from one of said portions to the other before it reaches the passage formed by the notch.

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